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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

LUND, JEFFRIE ROBERT

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 11/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/759,953

Applicant(s)

SATOH ET AL.

Examiner

Jeffrie R. Lund

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 August 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-19 and 45 is/are pending in the application.
- 4a) Of the above claim(s) 11-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-10,14-19 and 45 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>8/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5-6 and 8-10 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shang et al, EP 0 697 467, in view of Igarashi et al, U.S. Patent 5,031,571, and Iyer et al, U.S. Patent 6,498,109, and Fong et al, US 5,812,403, or Fong et al, US 5,939,831.

Shang et al shows the invention substantially as claimed including a chemical vapor deposition device comprising: a deposition reaction chamber 10; a plasma discharge chamber 46 that is provided remotely from the reaction chamber; wherein the plasma discharge chamber includes a capacitively coupled RF plasma source and comprises a source of cleaning gas 44, wherein the source of cleaning gas is connected to the plasma discharge chamber; and a stainless steel piping 57 that links the reaction chamber and the remote plasma discharge chamber, wherein energy coupled to the remote plasma discharge chamber activates cleaning gas within the plasma discharge chamber, and the activated cleaning gas is brought into the inside of the reaction chamber through the piping and changes solid substances adhered to the inside of the reaction chamber as a consequence of film formation, to gaseous substances, thereby cleaning the inside of the reaction chamber (see fig. 1 and its description).

Shang et al does not expressly disclose a wall of the plasma discharge chamber that is made of an aluminum alloy, wherein the wall is exposed to plasma discharge, and the plasma discharge chamber including a radio frequency energy source connected to plasma discharge chamber electrodes, wherein the RF energy source operates at a frequency between about 300 kHz and about 500 kHz and a power between 50 watts to 5 kilowatts.

Igarashi et al discloses a capacitively coupled RF plasma power source including plasma discharge chamber electrodes 10,20 with an exposed aluminum alloy chamber 30 (see fig. 1 and its description, and col. 3-lines 59- 66).

In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Shang et al so as to include the capacitively coupled structure of Igarashi et al for the plasma discharge chamber because this is shown to be a suitable means in which to energize gas into plasma.

Shang et al and Igarashi et al do not expressly disclose wherein the RF energy source operates at a frequency between about 300 kHz and about 500 kHz.

Iyer et al teaches a plasma processing apparatus (see fig. 1) including a remote plasma discharge 12 coupled to a plasma energy source 28, wherein the plasma energy source may be a pair of oppositely placed electrodes in order to create reactive species where the frequency can range from 10 KHz to 200 MHz (see col. 3-lines 24-60).

In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Shang et al modified by Igarashi et al so as to have electrodes of the plasma discharge chamber operating at the frequencies disclosed by Iyer because these frequencies are shown to be suitable for creating reactive species.

Shang et al, Igarashi et al and Iyer et al do not expressly disclose the claimed valve positioned in the piping that links the reaction chamber and the remote plasma discharge chamber.

Fong et al '403 and Fong et al '831 disclose an apparatus comprising a through valve 280 positioned between a remote plasma chamber 55 and a reaction chamber. The valve has an opening sized, when fully opened, substantially equal in width to the inner surface of the piping 47, and does not have projections with respect to the inner surface of the piping. Therefore, the valve, when fully open, defines a pressure drop across the valve of less than about 0.25 Torr. (See figures 3 and 6a)

Therefore, in view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Shang et al modified by Igarashi et al and Iyer et al to further comprise a through valve positioned in the piping between the reaction chamber and the remote plasma chamber, as taught by Fong et al '403, or Fong et al '831 in order to open or block the activated cleaning gas passage 47 thereby introducing the activated cleaning gas into the processing chamber or stopping the activated cleaning gas from entering the

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processing chamber, and preventing processing gases from entering the remote plasma chamber as taught by Fong et al '403, or Fong et al '831.

3. Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shang et al, EP 0 697 467 in view of Igarashi et al, U.S. Patent 5,031,571 and Iyer et al, U.S. Patent 6,498,109, and Fong et al, US 5,812,403, or Fong et al, US 5,939,831, as applied to claims 1-3, 5-6 and 8-10 and 14-16 above, and further in view of Noble et al, U.S. Patent 6,450,116.

Shang et al, Igarashi et al, Iyer et al, Fong et al '403, Fong et al '831, are applied as above but do not expressly disclose a, reaction gas inlet and outlet defining a horizontal flow across a substrate surface upon which material is deposited within the reaction chamber, wherein the piping opens into the reaction chamber downstream of the inlet and upstream of a substrate support configured for supporting a substrate within the chamber, and wherein the reaction chamber comprises quartz walls and radiant heating elements.

Noble et al disclose a process gas entering into the reaction chamber 213 from the inlet 214 and passing over the substrate 100 in the reaction chamber and being exhausted via 253 (see fig. 3A and its description).

In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Shang et al modified by Igarashi et al and Iyer et al, and Fong et al '403 or Fong et al '831, so as to include the gas inlet/outlet structure of Noble et al because such a structure is shown to

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be a suitable means in which to introduce and remove gas from a plasma processing chamber.

Concerning the quartz walls and the radiant heating elements, Noble et al includes light pipe assembly 218 including lamps 219 disposed between quartz plates 247,248 (see col. 7-line 59 to col. 8-line 36).

In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Shang et al modified by Igarashi et al and Iyer et al and Fong et al '403 or Fong et al '831, so as to include the quartz plates and radiant heating elements because this will allow for the apparatus to be capable of conducting processing at elevated temperatures.

With respect to the piping being at least $\frac{1}{2}$ inch in diameter, a prima facie case of obviousness still exists because it would have been obvious to one of ordinary skill in the art to optimize the diameter of the piping during routine experimentation depending upon, for example, the desired flow of activated gas, and would not lend patentability to the instant application absent the showing of unexpected results. Additionally, where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device.

4. Claim 45 is rejected under 35 U.S.C. 103(a) as being Unpatentable over Shang et al, EP 0 697 467, in view of Igarashi et al, U.S. Patent 5,031,571, and Iyer et al, U.S. Patent 6,498,109, and Fong et al, US 5,812,403, or Fong et al, US 5,939,831, as

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applied to claims 1-3, 5-6 and 8-10 and 14-16 above, and further in view of Ikeda et al, U.S. Patent 5,520,142.

Shang et al, Igarashi et al, Iyer et al, Fong et al '403, Fong et al '831, are applied as above but do not expressly disclose wherein the wall is anodized.

Ikeda et al discloses forming a chamber wall of aluminum and anodizing the exposed portion in the plasma chamber (see fig. 1 and its description).

In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Shang et al modified by Igarashi et al and Iyer et al and Fong et al '403 or Fong et al '831, so as to have an anodized inner wall because Ikeda et al shows this to be a suitable treatment to be done to a wall of a plasma chamber.

Response to Arguments

5. Applicant's arguments, see pages 8-9 the arguments entitled "The Claimed Valve is Not Taught by the Cited Art for this Use", filed August 22, 2006, with respect to the 103 rejections under Shang et al. EP 0697467, in view of Igarashi et al ('571), Iyer et al. ('109), and Yin et al. ('812) or Sun et al, ('183), or Fukuda et al ('578) have been fully considered and are persuasive. The 103 rejections under Shang et al. EP 0697467, in view of Igarashi et al ('571), Iyer et al ('109), and Yin et al ('812), or Sun et al ('183), or Fukuda et al ('578) have been withdrawn.

The Examiner agrees the arguments directed to Yin et al, Sun et al, and Fukuda et al.

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6. Applicant's arguments filed August 22, 2006 have been fully considered but they are not persuasive.

a. The arguments directed to Shang et al, US Patent 5,788,778, are moot because Shang et al, US Patent 5,788,778, is not used in the present rejections.

b. In regard to the argument:

The internal structure of Fong's valve 280 in the '403 and the '831 references is not illustrated and no details are provided in either the figure or its description (see col. 26, lines 15- 59 and Figure 1A).

The Examiner disagrees. Fong et al clearly shows a top view (figure 6a) and side view (figure 3) of the flow path through the valve. The opening of the valve is substantially the same size as the inner surface of pipe 47, and no projections are shown in the figures. Therefore, the valve of Fong et al teaches all the limitations of the claimed valve.

c. In regard to the argument that "No Motivation or reason has been supplied for selecting valves with the presently recited features", the Examiner disagrees. Fong et al clearly teaches that the purpose of the valve 280 is to block passage 47 to prevent activated cleaning gases from entering the processing chamber and contaminating the reaction during processing, and blocking processing gas from entering the remote plasma chamber. The valve also allows positive control of the cleaning gases allowing them to enter the chamber only when the valve is open. Shang et al, EP 0 697 467, does not teach any valve between the cleaning system and the process gas supply. One of ordinary skill in the art reading both Shang et al and Fong et al would be motivated to add the through valve of Fong et al for the reasons taught by Fong et al.

d. In regard to the argument that "The Claimed Valve has a Particular Advantage When Used in the Claimed Combination", the Examiner agrees. However, the efficiency of the cleaning is not claimed and is a function of the structure of the apparatus. Any valve having the claimed structure in a plasma cleaning system will have the argued efficiency. Fong et al teaches a valve having the claimed structure. The combination of Shang et al, Igarashi et al, Iyer et al, and Fong et al US '403, or Fong et al '831 teaches a plasma cleaning system with the claimed valve structure, and thus the argued efficiency.

e. The argument that "The Prior Art Taught Away from the Use of a Through-Flow Valve in Cleaning" is moot because it does not matter what the prior art, not used in the rejection, teaches. Only the teachings of the prior art used in the rejection are relevant.

f. In regard to the argument:

Shang EP 0697467 teaches that a filter 56 should be placed between the remote chamber 46 and the processing chamber. Applicants note that the use of filters in this location was common and that their use will result in the restriction of the flow of gas, making the presently recited type of valve a pointless modification.

The Examiner disagrees. First, the open claim language does not prevent the use of a filter. Second, it would be obvious to remove filter with the corresponding loss of the filtered product. Third, the statement that "the use of filters in this location was common and that their use will result in the restriction of the flow of gas, making the presently recited type of valve a pointless modification" is incorrect because the pressure drop and loss of efficiency is commutative (i.e. the pressure drop and efficiency drop across the filter and the pressure drop and

efficiency drop across the valve cause the total pressure and efficiency drop from the remote plasma source to the chamber). Thus, the pressure drop and loss of efficiency across the valve is the same with or without a filter.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

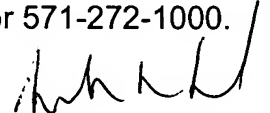
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeffrie R. Lund whose telephone number is (571) 272-1437. The examiner can normally be reached on Monday-Thursday (6:30 am-6:00pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Jeffrie R. Lund
Primary Examiner
Art Unit 1763

JRL
11/13/06